

## **Chapter 14**

### **Prevention of Significant Deterioration**



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## **1.0 Introduction**

Prevention of Significant Deterioration (PSD) regulations apply to major stationary sources and major modifications to existing sources which meet certain criteria concerning the emission rates, type of pollutants to be emitted, and geographic location. No source or modification subject to today's rules may be constructed without a permit, which states that the stationary source or modification would meet applicable PSD or National Ambient Air Quality Standards (NAAQS) requirements. Requirements in this chapter must be followed by all agencies or groups that conduct PSD monitoring within the state of Indiana and submit data to the U.S. EPA Air Quality System (AQS) database. Requirements for PSD monitoring can be found in the Clean Air Act of 1977, Part D, revised August 7, 1980.

If the proposed source or modification is within 10 km of a Class I area (national parks, forest or wilderness areas), representatives of the proposed source or modification must be prepared to demonstrate for each regulated pollutant it would emit that there would be no significant impact on the Class I area. Significant impact is defined in the PSD regulation (40 CFR 52).

The PSD application process must include adequate public participation. The regulations solicit and encourage participation by the general public, industry, and other affected persons impacted by the proposed major source or major modification. Specific public notice requirements and a public comment period are required before the PSD review agency takes final action on a PSD application. The public notice must indicate whether the reviewing authority proposed permit approval, denial, or conditional approval of a proposed major source or major modification. Consideration is given to all comments received provided they are relevant to the scope of the review. Where requested, or at its own discretion, the reviewing authority may conduct a public hearing to help clarify the issues and obtain additional information to assist in making a final permit decision.

The source owner, once receiving a PSD permit, must start construction within a reasonable period of time (typically within 18 months of approval) and must stay on a continuous construction schedule. Normally, long delays will invalidate the permit.

The PSD permit will state the ambient air monitoring requirements: duration of monitoring, the parameters to be monitored, and the number of monitoring sites. Dispersion modeling is performed to determine the areas of maximum impact. The air monitoring site location must be located in the maximum impact areas and be approved by the OAQ prior to start-up.

## **2.0 40 CFR Part 58 Appendix B Requirements**

### **2.1 General Information**

Quality assurance of air monitoring systems includes two distinct and important interrelated functions. One function is the control of the measurement process through the implementation of policies, procedures, and corrective actions. The other function is the assessment of the quality of the monitoring data. The general thought for a monitoring system is, a greater effort and effectiveness of the control, usually results in better quality of the monitoring data.

Therefore, data quality assessment is used to determine whether the control efforts need to be increased.

Documentation of the assessments of the monitoring data is important to data users, who can then consider the impact of the data quality in specific applications. Accordingly, assessments of PSD monitoring data quality are required to be made and reported quarterly by the monitoring organization to the OAQ. The data must be submitted no later than required for AQS data submittal.

## **2.2 Ambient Monitoring and Quality Assurance Requirements**

Each organization must develop and implement an ambient monitoring and a quality assurance program consisting of policies, procedures, specifications, and standard documentation necessary to:

1. Provide data of adequate quality to meet monitoring objectives and quality assurance requirements of the permit granting authority, and
2. Minimize loss of air quality data due to malfunctions or out-of-control conditions.

These programs must be described in detail and suitably documented in a monitoring and quality assurance plan. The monitoring/quality assurance plans should be submitted to the Office of Air Quality, Air Monitoring Branch, for review and approval prior to the initial start date for any monitoring program. The quality assurance activities and ambient monitoring activities will be reviewed during the annual system/performance audits.

At a minimum, each quality assurance program must include information and operational procedures for each of the following activities:

1. Methods, analyzers, or samplers
2. Training
3. Description of equipment, shelters, terrain, probes material, height of the sample inlet, and a general mapping of the monitoring area;
4. Selection and control of calibration standards
5. Calibration
6. Zero/span checks and adjustments of automated analyzers
7. Control checks and their frequency
8. Control limits for zero, span, and other control checks, and respective corrective actions when such limits are surpassed
9. Calibration and zero/span checks for multiple range analyzers
10. Preventive and remedial maintenance
11. Recording and validating data
12. Data quality assessment
13. Documentation of quality control information

Gaseous pollutant concentration standards (permeation devices or cylinders of compressed gas) used to obtain calibration or test concentrations for CO, SO<sub>2</sub>, and NO<sub>2</sub> must be traceable to either a National Institute of Standards and Technology (NIST), Standard Reference Material (SRM), or available Certified Reference Material (CRM). All calibration systems using standards must be certified by the Quality Assurance Certification Facility (QACF) prior to instrument calibrations and audits. (See the OAQ, Quality Assurance Manual (QAM), Chapter 6 Certification Methods of Transfer Standards.)

Test concentrations for ozone must be obtained in accordance with the UV photometric calibration procedure specified in Appendix D of 40 CFR Part 50, or by means of a certified ozone transfer standard. These systems must be certified by the QACF prior to instrument calibrations or audits. (See the OAQ, QAM, Chapter 6, Certification of Methods for Transfer Standards.)

Flow rate measurements must be made by a flow measuring instrument that is traceable to an NIST volume or the QACF's standards.

Each organization operating PSD network stations shall be subject to an annual systems/performance evaluation performed by the Office of Air Quality (OAQ) Quality Assurance Section (see Chapter 15). Also, each network is required to participate in the EPA's National Performance Audit Program Section (NAPA) 2.4 of 40CFR, Part 58, App. A and B.

## **2.3 Data Quality Assessment Requirements**

All ambient monitoring methods or analyzers used in PSD monitoring shall be tested periodically to quantitatively assess the quality of the data being routinely collected. The results of these tests shall be reported to the OAQ, QAS quarterly (see Section 2.6). Concentration measurements reported from analyzers or analytical systems being tested must be derived by means of the same calibration curve and data processing system used to obtain the routine air monitoring data.

Table 1 provides a summary of the minimum data quality assessment requirements.

### **2.3.1 Precision of Automated Methods**

An one-point precision check must be carried out at least once every two weeks on each automated analyzer used to measure SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub> and CO. The precision check is made by challenging the analyzer with a precision check gas of known concentration between 0.080 and 0.100 ppm for SO<sub>2</sub>, NO<sub>2</sub>, and O<sub>3</sub> analyzers, and between 8.0 and 10.0 ppm for CO analyzers.

Most analyzers must operate in their normal sampling mode during the precision check, and the test atmosphere must pass through all filters, scrubbers, conditioners or other components used during normal ambient sampling and as much of the ambient air inlet system as practicable (certain CO and NO<sub>y</sub> analyzer exempted). If permitted by the associated operation or instruction manual, an analyzer may be temporarily modified during the precision check to reduce vent or

purge flows, or the test atmosphere may enter the analyzer at a point other than the normal sample inlet, provided that the analyzer's response is not likely to be altered by these deviations from the normal operation mode. If a precision check is made in conjunction with a zero or span adjustment, it must be made prior to such zero or span adjustments.

Report the actual concentrations of the precision check gas and the corresponding concentrations indicated by the analyzer. The percent difference between these concentrations is used to assess the precision of the monitoring data.

### 2.3.2 Accuracy of Automated Methods

Each sampling quarter, analyzers that monitor for SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, or CO must be audited for accuracy at least once. The audit is made by challenging the analyzer with at least one audit gas of known concentration from each of the following ranges. The concentration for this audit must fall within the measurement range of the analyzer being audited. Any accuracy audit must be done using a completely different system than one used for calibration of the analyzer.

Audit Level	Concentration Range, ppm		
	SO <sub>2</sub> , O <sub>3</sub>	NO <sub>2</sub>	CO
1	0.030 - 0.080	0.030 - 0.080	3.0 - 8.0
2	0.150 - 0.200	0.150 - 0.200	15.0 - 20.0
3	0.350 - 0.450	0.350 - 0.450	35.0 - 45.0
4	0.800 - 0.900	x	80.0 - 90.0

NO<sub>2</sub> audit gas for chemiluminescence-type NO<sub>2</sub> analyzers must also contain residual NO concentration of at least 0.080 ppm NO and not greater than 0.120 ppm NO.

Note: NO concentrations substantially higher than 0.120 ppm, that may occur when using some gas phase titration (GPT) techniques, may lead to audit errors in chemiluminescence analyzers due to inevitable minor NO-NO<sub>x</sub> channel imbalance. Such errors may be atypical of routine monitoring errors to the extent that such NO concentrations exceed typical ambient NO concentrations. These errors may be minimized by modifying the GPT technique to maintain NO concentrations between 0.080 - 0.120 ppm.

Working or transfer standards and equipment used for auditing must not be the same as the standards and equipment used for calibration and spanning, but may be referenced to the same NIST, SRM, CRM, or primary UV photometer. The auditor should not be the operator or analyst who conducts the routine monitoring, calibration, or analysis.

The analyzer should be audited through its normal sampling mode such that the test atmosphere passes through all filters, scrubbers, conditioners, and other sample inlet components used during normal ambient sampling and as much of the ambient air inlet system as is practicable. The



exception given for certain CO and NO<sub>y</sub> analyzers in precision checks does not apply for accuracy audits.

Report both the audit test concentrations and the corresponding concentration measurements indicated or produced by the analyzer being tested. The percent differences between these concentrations are used to assess the accuracy of the monitoring data.

### **2.3.3 Precision of Manual Methods (PM<sub>10</sub>)**

For a given organization's monitoring network, one sampling site must have a collocated sampler. The site with the highest expected 24-hour pollutant concentration must be selected. The two samplers must be within 4 meters of each other but at least 2 meters apart to preclude air flow interference. Calibration, sampling, and analysis must be the same for both samplers as well as for all other samplers in the network. The collocated sampler must be operated on the National six-day schedule with the reporting sampler. For each pair of collocated samplers, designate one sampler as the sampler which will be used to report air quality for the site and designate the other as the duplicate sampler. The difference in measured concentration ( $\mu\text{g}/\text{m}^3$ ) at standard reference condition (SRC) between the two samplers is used to calculate precision.

### **2.3.4 Precision of Pb Method**

The operation of collocated samplers at one sampling site must be used to assess the precision of the reference or an equivalent Pb method. The procedure to be followed for Pb methods is the same as described in the OAQ, Quality Assurance Manual (QAM), Analytical Section's SOP (Standard Operating Procedure).

### **2.3.5 Accuracy of Manual Methods (PM<sub>10</sub>)**

The accuracy of manual sampling methods is assessed by auditing a portion of the measurement process. For particulate matter methods, the flow rate during sample collection is audited at least once per quarter. Audit the flow at the normal flow rate, using a certified flow transfer standard. The flow transfer standard used for the audit must not be the same one used to calibrate the flow of the sampler being audited, although both transfer standards may be referenced to the same primary flow or volume standard. The differences in flow rate in ( $\text{m}^3/\text{min}$  at SRC) between the audit flow measurement and the flow indicated by the sampler's normal flow indicator is used to calculate accuracy. For further information regarding particulate monitoring, see the OAQ, QAM, Chapter 7, "Measurement of Suspended Particulates".

### **2.3.6 Accuracy of Pb Method**

For Pb methods, the flow rate and analytical measurements are audited. During each sampling quarter, audit the flow rate of each high-volume Pb sampler at least once. The procedure to be followed for Pb methods is the same as described in OAQ, QAM, Analytical Section's SOP.

For each sampling quarter, audit the Pb analysis using glass fiber strips containing a known quantity of lead. Audit samples are prepared by depositing a Pb solution on 1.9 cm by 20.3 cm. (3/4 inch by 8 inch) unexposed glass fiber filter strip and allowing it to dry thoroughly. The

audit samples must be prepared using reagents different from those used to calibrate the Pb analytical equipment. Prepare audit samples in the following concentration ranges:

Ranges	Pb Concentration Total $\mu\text{g}/\text{Strip}$	Equivalent Ambient Pb Concentration $^*\mu\text{g}/\text{m}^3$
1	100 to 300	0.5 to 1.5
2	600 to 1000	3.0 to 5.0
3	Blank	0.0

\*Equivalent ambient Pb concentration in  $\mu\text{g}/\text{m}^3$  is based on sampling at  $1.30 \text{ m}^3/\text{min}$  for 24 hours on a 20.3 cm X 25.4 cm (8 inch X 10 inch) glass fiber or quartz filter.

Audit samples must be extracted using the same extraction procedure used for exposed filters.

The procedure to follow is found in the OAQ, QAM, Analytical Section's SOP (Standard Operating Procedure).

Analyze at least one audit sample in each of the two ranges each day that samples are analyzed. The difference between the audit concentration in ( $\mu\text{g Pb}/\text{strip}$ ) and the analyst's measured concentration in ( $\mu\text{g Pb}/\text{strip}$ ) is used to calculate accuracy.

The accuracy of an equivalent method is assessed in the same manner as the reference method. The flow auditing device and Pb analysis audit samples must be compatible with the specific requirements of the equivalent method.

## 2.4 Calculations for Automated Methods

The following calculations are for single analyzer precision and single analyzer accuracy.

### 2.4.1 Single Analyzer Precision

Each organization, at the end of each sampling quarter, shall calculate and report a precision probability interval for each analyzer. If monitoring data are invalidated during the period represented by a given precision check, the results of that precision check shall be excluded from the calculations. Calculate the percentage difference ( $d_i$ ) for each precision check using Equation 1.

### Equation 1

$$d_i = \frac{(Y_i - X_i)}{X_i} \times 100$$

Where:

$Y_i$  = analyzer's indicated concentration from the i-th precision check  
 $X_i$  = known concentration of the test gas used for the i-th precision check

For each instrument, calculate the quarterly average ( $d_j$ ), Equation 2, and the standard deviation ( $S_j$ ), Equation 3.

### Equation 2

$$d_j = \frac{1}{n} \sum_{i=1}^n d_i$$

### Equation 3

$$S_j = \sqrt{\frac{\sum_{i=1}^n d_i^2 - \frac{(\sum_{i=1}^n d_i)^2}{n}}{n-1}}$$

Where:

n is the number of precision checks on the instrument made during the sampling quarter.

Calculate the 95 percent probability limits for precision using Equations 4 and 5.

### Equation 4

$$\text{Upper 95\% Probability Limit} = d_j + 1.96S_j$$

### Equation 5

$$\text{Lower 95\% Probability Limit} = d_j - 1.96S_j$$

## 2.4.2 Single Analyzer Accuracy

At the end of each sampling quarter, each organization shall calculate and report the percentage difference for each audit concentration for each analyzer audited during the quarter.

Calculate and report the percentage difference ( $d_i$ ) for each audit concentration using Equation 1 where  $Y_i$  is the analyzer's indicated concentration from the i-th audit check and  $X_i$  is the known concentration of the audit gas for the i-th audit check.

## 2.5 Calculations for Manual Methods

The calculations are for single instrument precision and single instrument accuracy.

### 2.5.1 Single Instrument Precision for Particulate Matter and Pb

Estimates of precision for ambient air quality measurements from the particulate matter and Pb methods are calculated from results obtained from the collocation of two samplers at one sampling site. At the end of each sampling quarter, calculate and report a precision probability interval using collocated sampler results.

For the paired measurements, calculate the percent difference ( $d_j$ ) using Equation 1a, where  $Y_i$  is the particulate matter or Pb concentration measured by the duplicate sampler and  $X_i$  is the particulate matter or Pb concentration measured by the sampler reporting air quality for the site. Calculate the quarterly average percentage difference ( $d_j$ ), Equation 2, standard deviation ( $S_j$ ), Equation 3, and upper and lower 95 percent probability limits for precision (Equations 6 and 7).

#### Equation 1a

$$d_i = \frac{Y_i - X_i}{(Y_i + X_i)} \times 100$$

#### Equation 6

$$\text{Upper 95 Probability Limit} = d_j + 1.96S_j / 2$$

#### Equation 7

$$\text{Lower 95 Probability Limit} = d_j - 1.96S_j / 2$$

### 2.5.2 Single Instrument Accuracy for Particulate Matter and Pb

At the end of each sampling quarter, each organization shall calculate and report the percentage difference for each sampler audited during the quarter.

For the flow rate audit, let  $X_i$  represent the known flow rate and  $Y_i$  represent the indicated flow rate. Calculate the percent difference ( $d_i$ ) using Equation 1.

### 2.5.3 Single-Analysis-Day Accuracy for Pb

At the end of each sampling quarter, each organization shall calculate and report the percent difference for each Pb analysis audit during the quarter.

For each analysis audited for Pb, let  $X_i$  represent the known value of the audit sample and  $Y_i$  the indicated value of Pb. Calculate the percent difference ( $d_i$ ) for each audit at each concentration level using Equation 1.

## 2.6 Organization Reporting Requirements

At the end of each sampling quarter, the organization must report the following data assessment information in PARS format and no later than 45 days after the end of the quarter (see Table 1).

1. For automated analyzers - precision probability limits from the single instrument precision checks and percent differences from the accuracy flow rate audits and single-analysis-day accuracy audits for Pb.
2. For manual methods - precision probability limits from the single instrument precision checks and percent differences from the accuracy flow rate audits and single-analysis-day accuracy audits for Pb.

The precision and accuracy information for the entire sampling quarter must be submitted with the air monitoring data. Air monitoring data must be submitted in AQS format. All data used to calculate reported estimates of precision and accuracy including span checks and collocated sampler and audit results must be made available to the permit granting authority upon request.

**TABLE 1**  
**Minimum PSD Data Assessment Requirements**  
**Precision**

<b>Method</b>	<b>Assessment Method</b>	<b>Coverage</b>	<b>Parameter Frequency</b>	<b>Reported</b>
Automated methods for SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub> , CO	Response check at concentration between .080 and .100 ppm*	Each analyzer	Once per 2 weeks	Actual concentration and measured concentration
Particulate Matter or Lead	Collocated Sampler	Highest conc. in monitoring network	Once per 6 day or every 3rd day for continuous sampling	Both measurements concentrations per site

### Accuracy

Method	Assessment Method	Coverage	Parameter Frequency	Reported
Automated methods for SO <sub>2</sub> , NO <sub>2</sub> , O <sub>3</sub> , CO	Response check at .030-.080 ppm* .150-.200 ppm* .350-.450 ppm* .800-.900 ppm* (if applicable)	Each analyzer	Once/quarter or Twice /quarter if just one analyzer/ pollutant / network	Actual concentration and measured concentration for each level
Particulate Matter PM-10 & Lead	Sampler flow check and check of analytical systems with Pb audit strips	Each PM-10 sampler Each Pb sampler analytical method	Once/Quarter PM-10 Pb Samples reanalyzed	Standard flow and observed flow rate at standard reference conditions; actual conc. of audit samples (µg/Pb/strip)

\*Concentration shown times 100 for CO.

## 3.0 Additional PSD Requirements

### 3.1 Manual Methods Frequency of Measurements

For particulate pollutants, continuous sampling is required except in areas where the applicant can demonstrate that significant pollutant variability is not expected. If sampling intermittently, the sampling schedule must adhere to the National six-day schedule.

### 3.2 Pollutant Standards

Gaseous standards (permeation tubes, permeation devices, cylinders of compressed gas) used to obtain test concentrations for CO, SO<sub>2</sub>, and NO must be traceable to standards in the certification facility of IDEM's Office of Air Quality, Quality Assurance Section (OAQ, QAS).

Ozone transfer standards must be certified by the OAQ, QAS traceable to the UV photometer primary standard in the certification facility.

Flow rate measurements must be made by a flow measuring instrument that is traceable to an NIST volume or the QACF's standards.

Prior arrangements must be made before standards are taken to the certification facility of OAQ, QAS. Pollutant standards must not be used unless their certification and traceability to OAQ, QAS is kept current.

### 3.3 Meteorological Parameters and Measurement Methods

The procedures in Chapter 9 "Meteorological Systems" of the OAQ, QAS Quality Assurance Manual must be followed.

### **3.4 Network Siting and Probe Siting**

The procedures to follow are found in OAQ, QAM, Chapter 1 "Quality Assurance of Air Monitoring".

### **3.5 Validation/Invalidation of Data**

The procedures to follow are in the OAQ, QAM, Chapter 11 "Valid Data Requirements".

If monitoring data is invalidated during the period represented by a given validation check for automated or manual methods, the results of the precision level check must be excluded from the precision and accuracy report data submitted quarterly.

### **3.6 Data Reporting**

All PSD ambient air quality data and quality assurance data must originate from sites with approved AQS identification numbers. All sites must meet EPA AQS reporting requirements for State and Local Ambient Monitoring Station (SLAMS).

### **3.7 Data Assessment**

The data assessment procedures to follow are in the OAQ, QAM, Chapter 13 "Quality Assessment and Statistical Analysis of Air Monitoring Data".

### **3.8 Calibration**

The calibration procedures to follow are in the OAQ, QAM, Chapters 1, 2, 3, 4, 5, and 7.